

(12) UK Patent Application (19) GB (11) 2 185 425 (13) A

(43) Application published 22 Jul 1987

(21) Application No 8625075

(22) Date of filing 20 Oct 1986

(30) Priority data

(31) 3601814

(32) 22 Jan 1986

(33) DE

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(51) INT CL⁴

B04B 1/08 // 11/04

(52) Domestic classification (Edition I):

B2P 10C3A 10C3B1B 10C3B3 10C3C2 10C3C3 2 4

(56) Documents cited

GB 1359157

GB 1315250

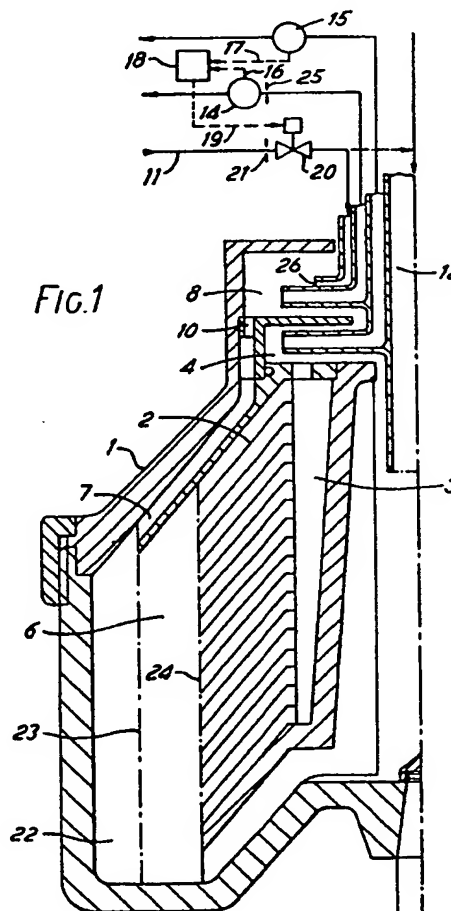
(58) Field of search

B2P

(54) Regulating operation of a centrifuge

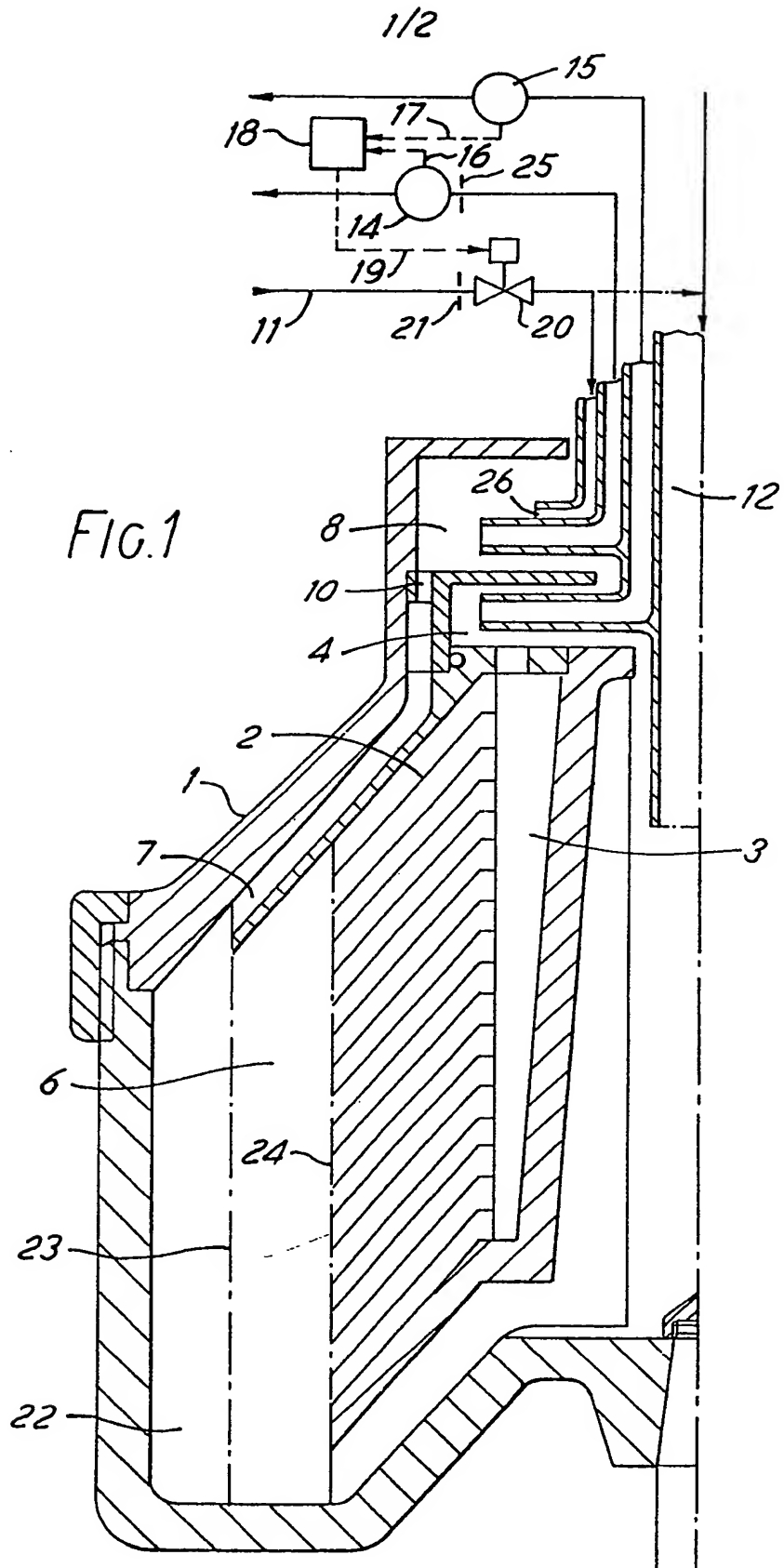
(57) In a process for separating two liquid phases by means of a centrifuge, the position of the separating zone is regulated by regulating supply of additional heavier phase. If the separating zone reaches line (23), then traces of the lighter phase appear in the heavier phase drain; these traces are detected (14) and a supply valve (20) is opened and the separating zone is displaced in the direction of line (24) by a time-limited supply of additional heavier phase. The heavier phase addition may be continued for a set period; or until traces of heavier phase are detected (15) in the lighter phase drain, whereupon the supply valve (20) is again closed. This process is continuously repeated, a larger amount of material being drained via the heavier phase drain than corresponds to the proportion of heavier phase in the product feed (12).

Two alternative arrangements are disclosed for supply of the additional heavier phase.



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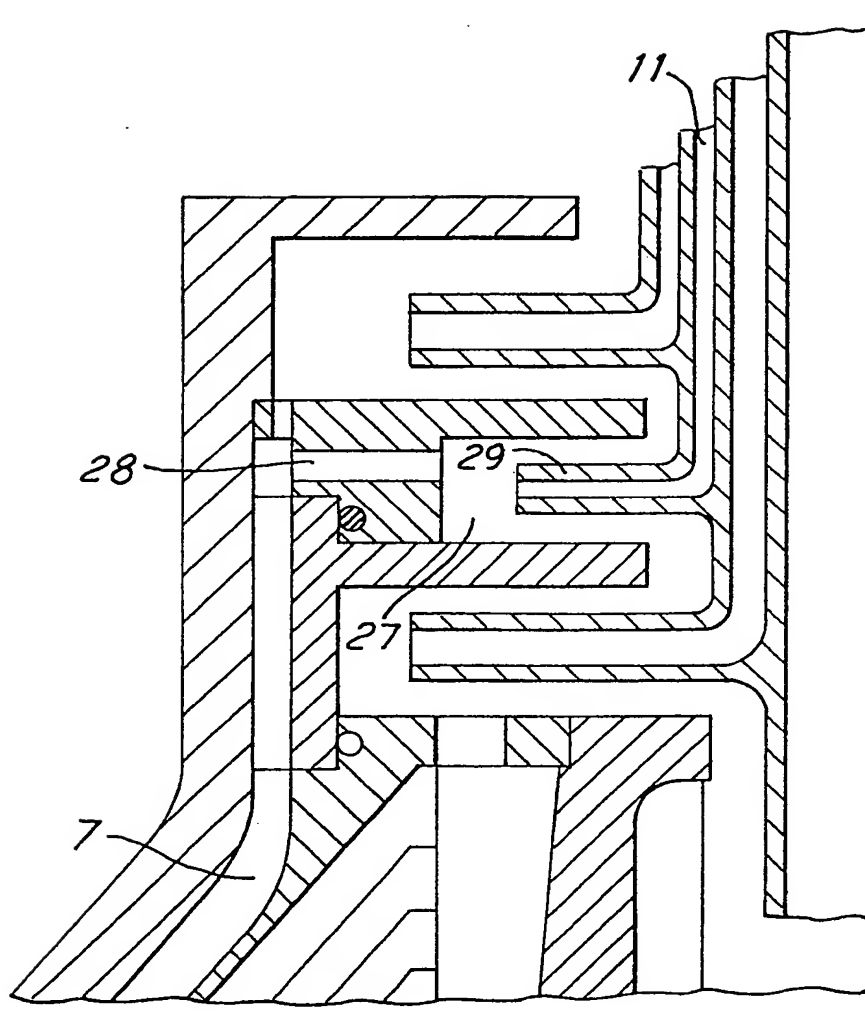


FIG. 2

SPECIFICATION

Process and apparatus for separating two liquid phases by means of a centrifuge

5 The present invention relates to a process and to an apparatus for separating two liquid phases forming a liquid mixture, possibly contaminated by solids using a centrifuge, whose
10 centrifugal drum is equipped with a tray or plate insert, whose internal diameter is connected to a drain for the lighter phase and which is also provided with an outlet pipe, which leads from the peripheral part of the
15 centrifugal drum into a concentric chamber, which is connected to a drain for the heavier phase, the radial position of the separating zone between the liquid phases within the centrifugal drum being regulated by the additional supply of heavier phase.

20 Such a process or apparatus is e.g. known from German patent 874 427, the regulation of the additional supply of the heavier phase taking place as a function of the radial position of the free liquid level in the central
25 chamber, which is connected to the drain for the heavier phase. This regulation procedure is only usable with product mixtures, whose phases have an adequately large density difference and whose characteristics only change to an insignificant extent, because otherwise,
30 despite a constant position of the free liquid level in the central chamber, there would be an inadmissible displacement of the separating zone and consequently either heavier phase
35 could pass into the drain for the lighter phase or vice-versa.

40 During the centrifugal cleaning of heavy oils, the densities of the oil and the water contained therein may be so close that even minor variations in the density, temperature or viscosity of the oil would lead to such inadmissible displacements of the separating zone. Thus, the known apparatus is unsuitable for
45 keeping constant the position of the separating zone.

50 The problem of the present invention is to provide a process making it possible to regulate the additional supply of heavier phase in such a way that an inadmissible displacement of the separating zone is reliably avoided.

55 This problem is solved in that the additional supply of heavier phase takes place for a predetermined period of time, as soon as traces of the lighter phase are detected in the heavier phase drain.

60 This problem can also be solved in that the additional supply of heavier phase is interrupted for a predetermined period of time, as soon as traces of the heavier phase are detected in the lighter phase drain.

65 This problem is also solved in that the additional supply of heavier phase takes place as soon as traces of the lighter phase are detected in the heavier phase drain and the additional

tional supply of heavier phase is interrupted as soon as traces of the heavier phase are detected in the lighter phase drain.

70 The apparatus for performing this process is characterized in that a detector is provided in the heavier phase drain making it possible to detect whether the heavier phase contains traces of the lighter phase and in the feed line for the additional supply of heavier phase a
75 shut-off device or valve is provided, which allows heavier phase to be supplied if traces of the lighter phase are detected by the detector in the heavier phase drain and the supply of heavier phase is prevented by means of a
80 control unit after a predetermined period of time.

85 The apparatus can also be constructed in such a way that a detector is provided in the lighter phase drain and detects whether the lighter phase contains traces of the heavier phase and in the feed line for the additional supply of heavier phase a shut-off device or valve is provided, which by means of a control unit prevents the supply of heavier phase
90 for a predetermined period of time, as soon as traces of the heavier phase are detected in the lighter phase drain.

95 It is also possible to construct the apparatus in such a way that a detector is provided in the heavier phase drain and detects whether the heavier phase contains traces of the lighter phase and a detector is provided in the lighter phase drain and detects whether the lighter phase contains traces of the heavier phase, a valve being provided in the feed line for the additional supply of heavier phase allowing by means of a control unit the additional supply of heavier phase traces of the lighter phase are detected in the heavier phase
100 drain and the supply of heavier phase is prevented as soon as traces of the heavier phase are detected in the lighter phase drain.

Advantageous developments are characterized in the subclaims.

110 The invention is described in greater detail hereinafter relative to non-limitative embodiments and the attached drawings, wherein show:

115 *Figure 1*, a cross-section through a centrifugal drum, in which the additional supply of heavier phase takes place in the product feed or in the central chamber.

120 *Figure 2*, a detailed section through a centrifugal drum, in which the additional supply of heavier phase takes place in the outlet pipe.

125 In Fig. 1, the centrifugal drum is 1, its tray or plate insert 2 having its internal diameter connected by means of duct 3 and chamber 4 to the lighter phase drain 5. An outlet pipe 7 leads from the peripheral part 6 of centrifugal chamber 1 into the central chamber 8, which is connected to the heavier phase drain 9. A constriction 10 is provided between outlet pipe 7 and central chamber 8. The feed 11 for the additional supply of heavier phase

either issues into the product feed 12 or into the central chamber 8. Product feed 12 is connected via inlet chamber 13 to the peripheral part 6. The heavier phase drain 9 contains a detector 14 and the lighter phase drain 5 a detector 15, which are connected via lines 16, 17 to a control unit 18. A line 19 leads from control unit 18 to shut-off device or valve 20, provided in feed 11. Upstream of valve 20 is connected a diaphragm 21.

The mixture to be separated is supplied to the centrifugal drum 1 through the product feed 12 and passes via inlet chamber 13 into peripheral part 6. Whilst the solids collect in solids chamber 22, the liquid phases separate in peripheral part 6, the heavier phase leaving centrifugal drum 1 via outlet pipe 7, constriction 10, central chamber 8 and drain 9. The drain capacity must be made higher than corresponds to the liquid proportion of the heavier phase in the product feed.

The lighter phase leaves the centrifugal drum via duct 3, chamber 4 and drain 5. The separating zone between these two phases is located between lines 23 and 24. As more heavier phase is drained off via drain 9 than product is supplied to the centrifugal drum, there is an outwards displacement of the separating zone until passing beyond line 23 and traces of the lighter phase pass into the heavier phase drain 9. This is detected by detector 14 and by means of control unit 18, it now opens valve 20 for a predetermined period of time, which is fixed in such a way that through the additional supply of heavier phase the separating zone is not displaced radially inwards over and beyond line 24. The heavier phase drain 9 contains a diaphragm 25, which limits the drain capacity to a value below the feed capacity fixed by diaphragm 21 in feed 11 for the additional supply of heavier phase.

The separating zone can be regulated in a similar manner in that initially the valve 20 in feed 11 is opened and the separating zone is displaced up to line 24, detector 15 located in the lighter phase drain 5 then detecting traces of heavier phase in the lighter phase and then brings about the closing of valve 20 for a predetermined time.

It can also be advantageous to allow the detector 14, 15 to act simultaneously on valve 20, so that the entire permitted range between lines 23, 24 for the separating zone is utilized, if valve 20 is not operated for a predetermined time and is instead opened in each case by detector 14 and closed by detector 15, as soon as said means respond.

If the additional supply of heavier phase takes place directly in central chamber 8, then the separating capacity of the centrifugal drum is not influenced. It is advantageous in this case to construct the end of feed 11 as a skimmer 26, which prevents an overflow of

than the feed pressure in feed 11.

according to Fig. 2, it is also advantageous to carry out the additional supply of heavier phase via a chamber 27, which is connected via a connecting duct 28 to the outlet pipe 7. Here again, the end of feed 11 is appropriately constructed as a skimmer 29.

The solids which have collected in solids chamber 22 can in known manner be discharged continuously from the centrifugal drum by means of nozzles, or intermittently by means of a controllable emptying system.

The heavier phase drained by means of drain 9 is advantageously collected in a not shown container and part of the liquid obtained is supplied again to the centrifugal drum by means of feed 11.

CLAIMS

1. A process for separating two liquid phases forming a liquid mixture, which may be contaminated by solids using a centrifuge, whose centrifugal drum is equipped with a tray or plate set, whose internal diameter is connected to a drain for the lighter phase and which is also provided with an outlet pipe, which leads from the peripheral part of the centrifugal drum into a concentric chamber, which is connected to a drain for the heavier phase, the radial position of the separating zone formed between the liquid phases in the centrifugal drum being regulated by the additional supply of heavier phase, wherein the additional supply of heavier phase takes place for a predetermined period of time, as soon as traces of the lighter phase are detected in the heavier phase drain.

2. A process for separating two liquid phases forming a liquid mixture, which may be contaminated by solids using a centrifuge, whose centrifugal drum is equipped with a tray or plate set, whose internal diameter is connected to a drain for the lighter phase and which is also provided with an outlet pipe, which leads from the peripheral part of the centrifugal drum into a concentric chamber, which is connected to a drain for the heavier phase, the radial position of the separating zone formed between the liquid phases in the centrifugal drum being regulated by the additional supply of heavier phase, wherein the additional supply of heavier phase being prevented for a predetermined period of time, as soon as traces of the heavier phase are detected in the lighter phase drain.

3. A process for separating two liquid phases forming a liquid mixture, which may be contaminated by solids using a centrifuge, whose centrifugal drum is equipped with a tray or plate set, whose internal diameter is connected to a drain for the lighter phase and which is also provided with an outlet pipe, which leads from the peripheral part of the

phase, the radial position of the separating zone formed between the liquid phases in the centrifugal drum being regulated by the additional supply of heavier phase, wherein the additional supply of heavier phase take place as soon as traces of the lighter phase are detected in the heavier phase drain and the additional supply of heavier phase is prevented as soon as traces of the heavier phase are detected in the lighter phase drain.

4. An apparatus for performing the process according to claim 1, wherein in the heavier phase drain is provided a detector, which makes it possible to detect whether the heavier phase contains traces of the lighter phase and a valve is provided in the feed line for the additional supply of heavier phase and permits heavier phase to be supplied if traces of the lighter phase are detected in the heavier phase drain by the detector and the supply of heavier phase is prevented by means of a control unit after a predetermined period of time.

5. An apparatus for performing the process according to claim 2, wherein in the lighter phase drain is provided a detector, which is used to detect whether the lighter phase contains traces of the heavier phase and a valve is provided in the feed line for the additional supply of heavier phase and ensures that the supply of heavier phase is stopped for a predetermined time by a control unit as soon as traces of the heavier phase are detected in the lighter phase drain.

6. An apparatus for performing the process according to claim 3, wherein the heavier phase drain contains a detector, which establishes whether the heavier phase contains traces of the lighter phase and a detector is provided in the lighter phase drain and detects whether the lighter phase contains traces of the heavier phase, a valve being provided in the feed line for the additional supply of heavier phase and allows the additional supply of heavier phase by means of a control unit if traces of the lighter phase are detected in the heavier phase drain and prevents the supply of heavier phase as soon as traces of the heavier phase are detected in the lighter phase drain.

7. An apparatus according to one of the claims 4 to 6, wherein the feed line for the additional supply of heavier phase is connected with the product feed of the centrifugal drum.

8. An apparatus according to one of the claims 4 to 6, wherein the feed line for the additional supply of heavier phase issues into the concentric chamber, which is connected to the heavier phase drain.

9. An apparatus according to claim 8, wherein the end of the feed line issuing into the concentric chamber is constructed as a skimmer.

10. An apparatus according to one of the

claims 4 to 6, wherein the feed line for the additional supply of heavier phase issues into a chamber arranged in the centrifugal drum and which is connected by means of a connecting duct to the outlet pipe for the heavier phase.

11. An apparatus according to one of the claims 4 to 6, wherein a constriction is provided between the outlet pipe and the concentric chamber.

12. An apparatus according to one of the claims 4 to 6, wherein the detector is constructed as a conductance measuring device.

13. A process for separating two liquid phases forming a liquid mixture substantially as described herein with reference to and as shown in the accompanying drawings.

14. An apparatus substantially as described herein with reference to and as shown in the accompanying drawings.

Printed for Her Majesty's Stationery Office
by Burgess & Son (Abingdon) Ltd, Dd 8991685, 1987.
Published at The Patent Office, 25 Southampton Buildings,
London, WC2A 1AY, from which copies may be obtained.